

Measuring Highway System Performance

Congestion and Delay

Robinson Hartsell

Public Transportation and Rail Division

Douglas B. MacDonald

Secretary of Transportation

Paula Hammond

Chief of Staff

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Measuring Highway System Performance

Is necessary to understand and develop an array of remedies for congestion.

“What gets measured, gets managed.”

How does WSDOT measure congestion?

In King and Snohomish Counties, the freeways have traffic detection loops embedded in the roadway.

- WSDOT collects loop data at five minute intervals
- 24 hours a day
- Seven days a week

Loop Data

Volumes and traffic density are collected, and used to calculate ...

- Speed
- Travel times
- Delay

Other Sources of Data

Areas without loop detectors

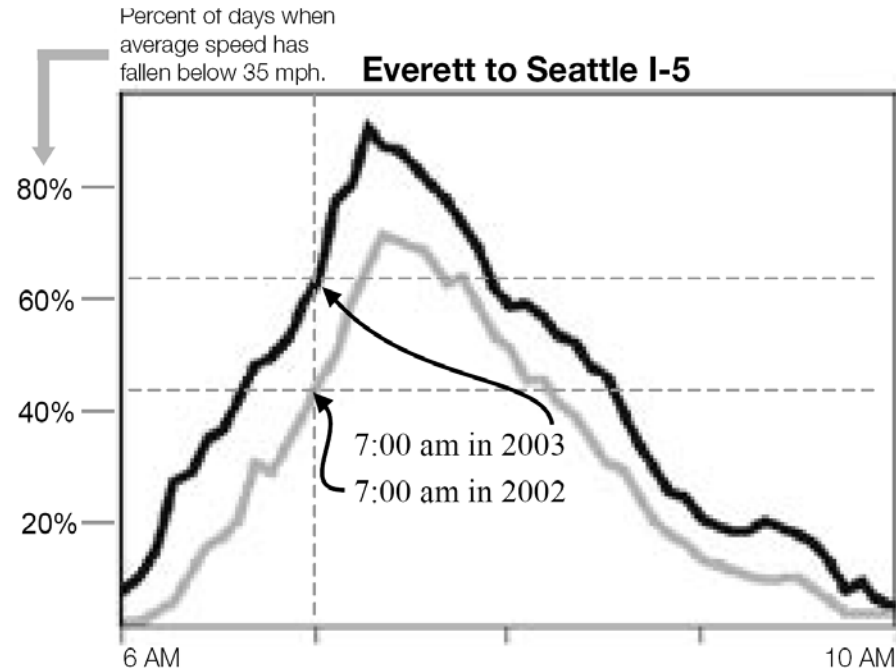
- Field reviews
- Information captured from completed construction plans
- Transponders and readers (e.g., SRTC monitoring program)
- Traffic models that use standard relationships to convert roadway capacity information and volume counts into speeds, delay and travel times.

Delay

Travelers on the roadway system experience congestion as delay.

What is Delay?

Delay is the difference between measured travel times and what the travel time would have been if traffic had been going the speed limit.



At 7:00 am in 2002, you had about a 45% chance that traffic would be moving at less than 35 mph. In 2003, the situation became worse (black line above the gray line); your chance that traffic would be moving slower than 35 mph was about 65% at 7:00 am.

Measuring Delay

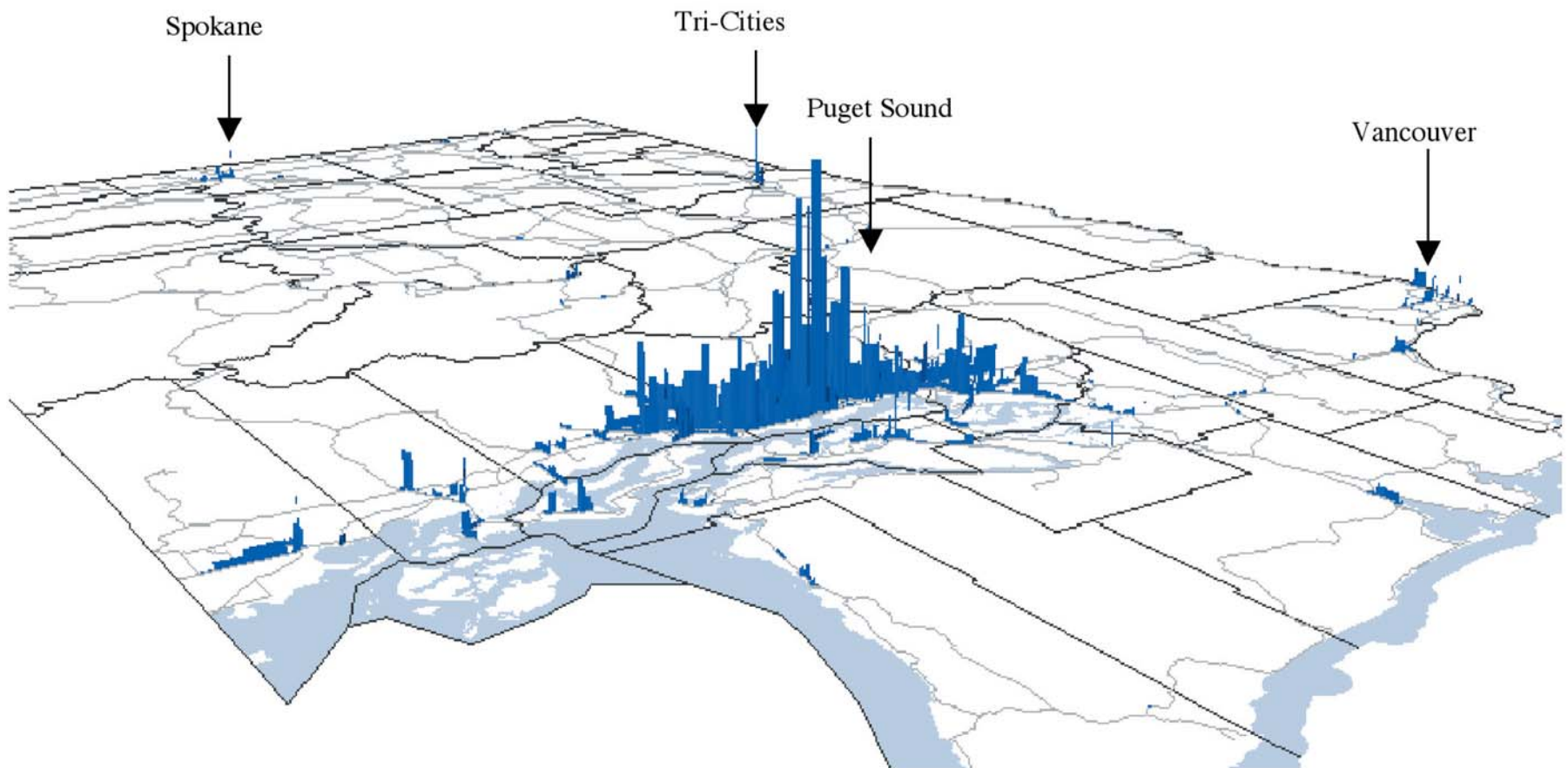
The sum of vehicle delay across an average twenty-four hour day is the most accessible measure for describing congestion.

It shows ...

- Which roadways are congested.
- A rough comparison of the severity of congestion.
- How long it lasts.

Relative Delay

Vehicle hours of delay, per day, per mile, on state highways



Lost Productivity

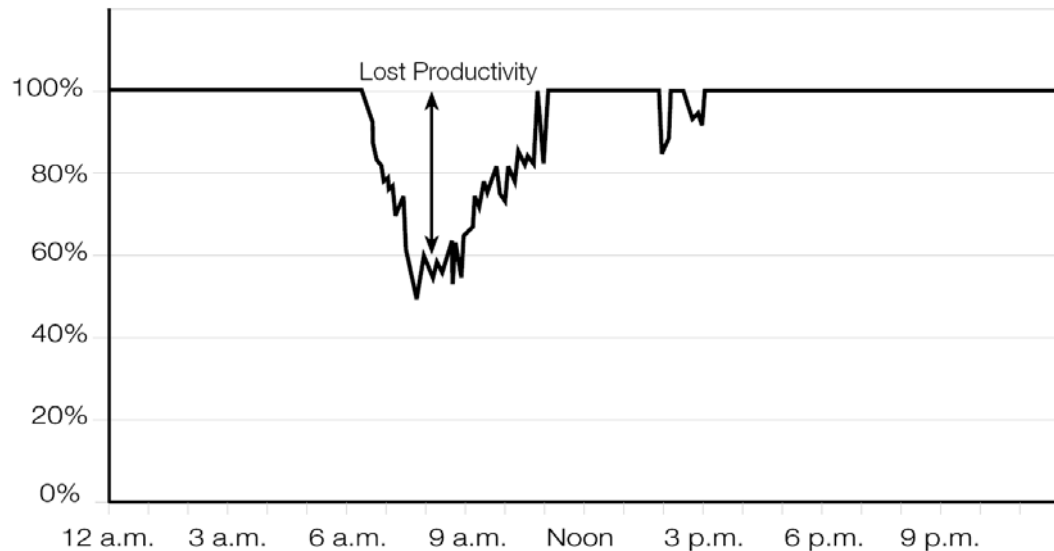
Delay causes the loss of productivity.

Delay reduces the throughput of the two general purpose lanes in Renton to the capacity of one free-flowing lane.

How do we improve productivity?

Invest in opportunities that provide optimal throughput.

Percent of Productivity Lost Due to Delay
Northbound I-405 at NE 24th Street



Source: WSDOT Urban Corridors Office

The Cost of Delay

Transportation system delay imposes costs due to lost travel time, and higher vehicle operating costs.

The cost of total delay on weekdays on the major Puget Sound freeways, was estimated at \$164 million in 2003.

Approximately two thirds was from lost time, and one third from higher vehicle operating costs.

Types of Congestion

Recurrent congestion

- Capacity
- Bottlenecks / chokepoints
- Poor signal timing

Non-recurrent congestion

- Incidents
- Inclement weather

Behavioral Congestion

- Special events, e.g., sporting, concerts
- Commute times and patterns
- Curiosity (slowing down to view an accident from the opposing lanes)

The Major Sources of Congestion

National comparison

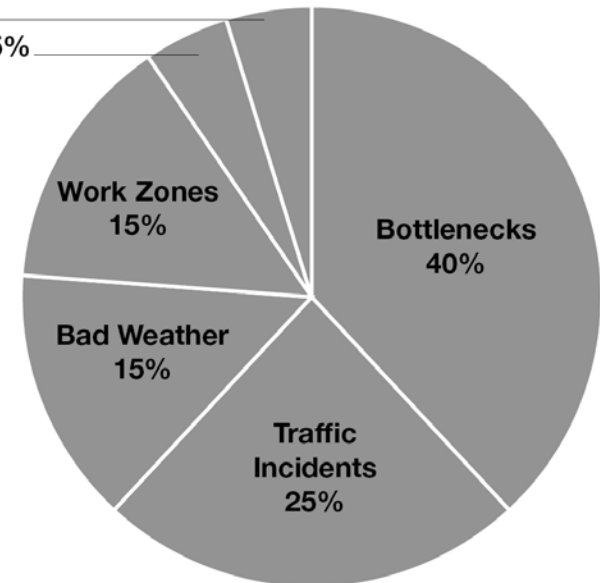
- 1) Bottlenecks
- 2) Traffic incidents
- 3) Bad weather / work zones

The Sources of Congestion

National Summary

Special Events 5%

Poor Signal Timing 5%



Federal Highway Administration's 2004 report *Traffic Congestion and Reliability: Linking Solutions to Problems*

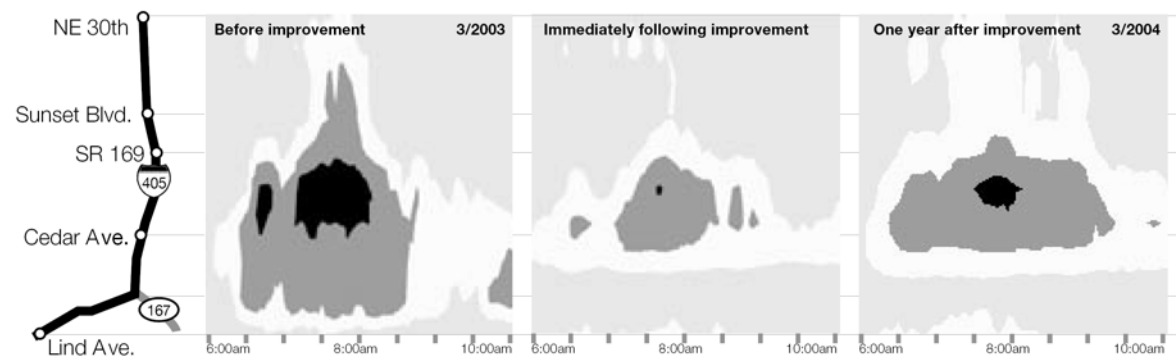
Spot Capacity Improvements

I-405 / SR 167 Interchange – Fly-over Ramp

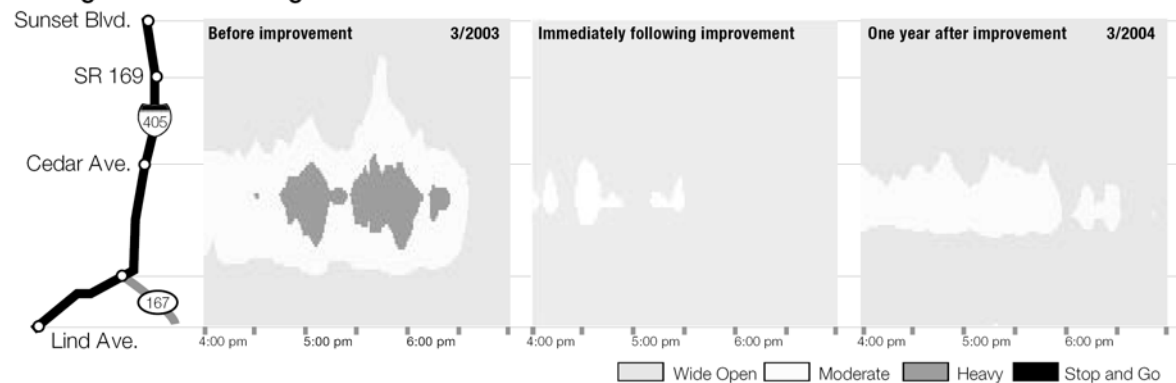
To understand the effect of spot capacity improvements, multiple measurements are necessary.

The graph shows location, severity, duration and extent.

Average Weekday Congestion I-405 Southbound



Average Weekend Congestion I-405 Southbound



Source: WSDOT NWR Traffic Operations

Ramp Metering

Managing traffic flow during congested periods

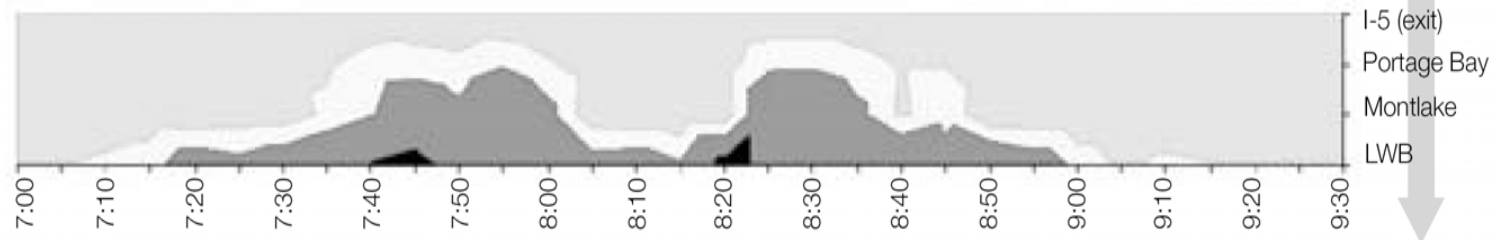
Before Ramp Metering:

SR 520 Eastbound Morning Congestion, I-5 (exit to SR 520) to Lake Washington Blvd. (LWB)
Wednesday July 25, 2001



After Ramp Metering:

SR 520 Eastbound Morning Congestion, I-5 (exit to SR 520) to Lake Washington Blvd. (LWB)
Thursday September 6, 2001



Wide Open Moderate Heavy Stop and Go

Source: WSDOT NWR Traffic Operations

Non-recurrent Congestion

Does Incident Response help ease congestion?

Measuring the effects of the Incident Response Team allows WSDOT to ...

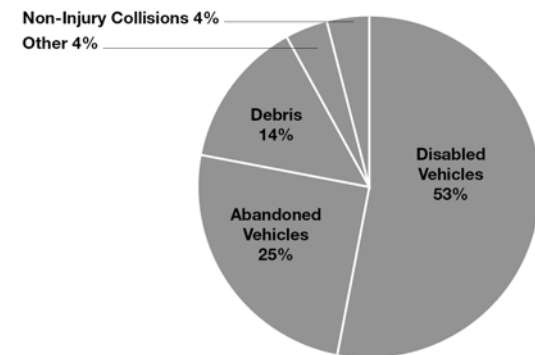
- Understand how incidents contribute to congestion
- Gauge the impact the program has on congestion.
- Determine where the IRT units will be most effective.

How Can Incident Response be More Effective?

Consider that the number and frequency of incidents on our highway system continues to grow, yet the number of IR units hasn't.

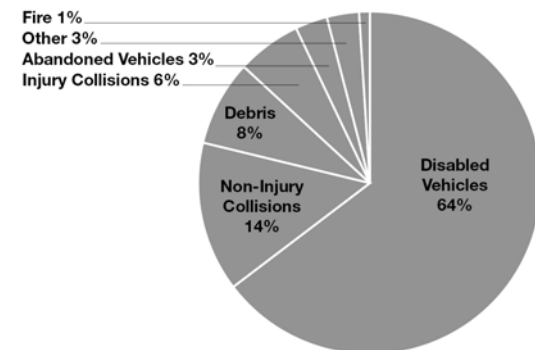
- Incidents lasting less than 15 minutes
- Incidents lasting 15 to 90 minutes
- Incidents lasting 90 minutes and longer

Incidents Lasting Less Than 15 Minutes (9,151)



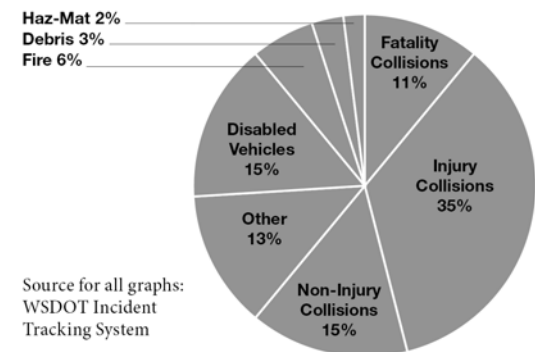
Fire, Injury Collisions, and Hazardous Material Incidents were less than 1% and are not shown in the above pie chart.

Incidents Lasting 15 to 90 Minutes (5,113)



Hazardous Material, Fatal Collisions were less than 1% and are not shown in the above pie chart.

Incidents Lasting 90 Minutes and Longer (235)



Source for all graphs:
WSDOT Incident
Tracking System

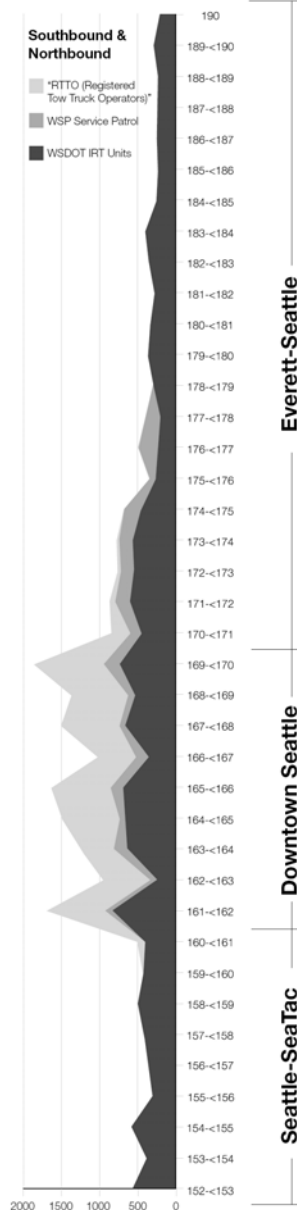
Abandoned vehicles were less than 1% and are not shown in the above pie chart.

The Grand Slam!

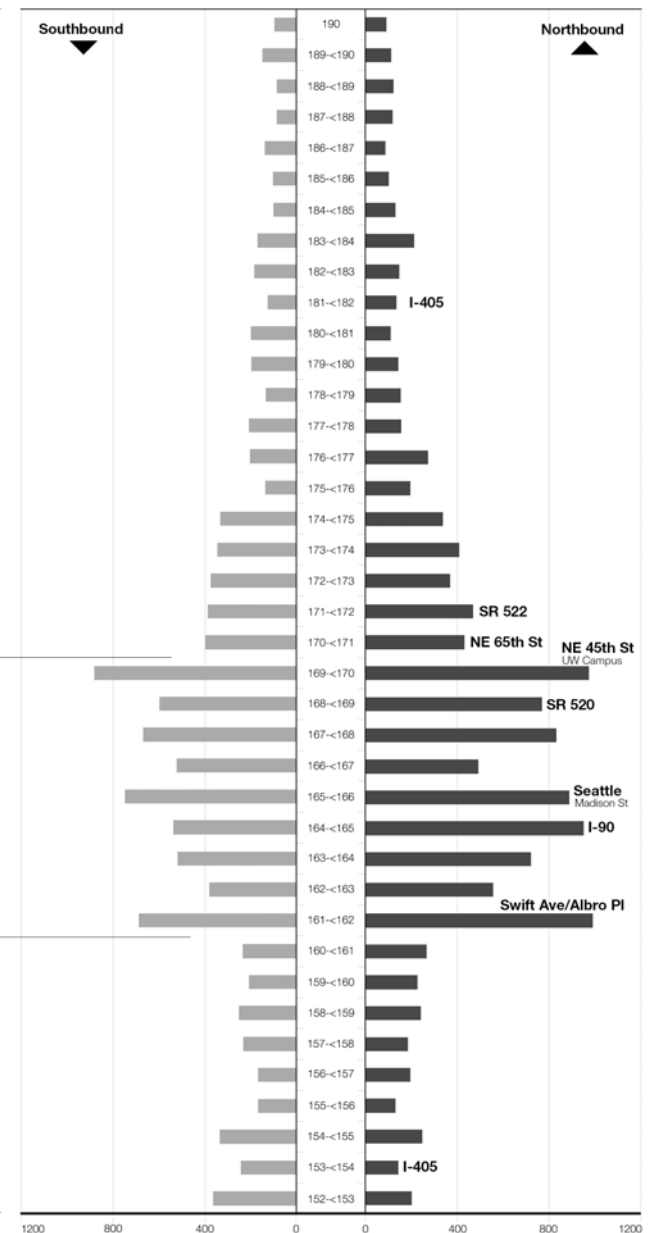
A chokepoint and a bottleneck at an incident prone location

- WSDOT Incident Tracking System (WITS)
- Interstate 5
- Between Everett and SeaTac
- April – June 2004
- Forty-one percent of all collisions responded to by WSDOT's Incident Response Team on the entire 276 miles of I-5, occurred in the nine-mile portion of downtown Seattle.

Number of Responses by Response Unit Type
I-5: Between SeaTac and Everett
January 2003 - September 2004



Number of Responses to Incidents by Milepost and Direction of Travel
I-5: Between SeaTac and Everett
January 2003 - September 2004



Behavioral Congestion

How do we measure the reason for the behavior?

Frankly, I don't have a clue. But we can certainly ...

- Understand what motivates people.
- Be prepared to answer the question
“What's in it for me?”
- Measure the effect of changes in
behavior

Benefits of Addressing Behavioral Congestion

In the Puget Sound Region ...

- CTR worksites are making nearly 13,500 fewer morning commute trips.
- If these trips were added back into the system, delay would increase by 6.3%.

Based on modeling by PSRC

Estimated Annual Delay Savings – 2001 Puget Sound Region In thousands of hours per year		
Public Transportation	HOV	CTR
29,690	975	1,677

Source: Texas Transportation Institute / PSRC / WSDOT

Robin Hartsell
WSDOT CTR Administrator
(360) 705-7508
hartser@wsdot.wa.gov